

cent. This rain continued with varying intensity until 8:20 p. m., the total recorded being 0.21 inch.

As far back as data extend there is no record of such abnormally high morning temperatures as occurred over southern California on the 17th. At the time of the readings, 4:40 a. m., San Diego reported 93.3°; Los Angeles, 90.3°; and the thermographs at El Cajon, Bonita, and Escondido showed 91.4°, 91.9°, and 92°, respectively.

We now know that these record temperatures and widely contrasting conditions were occasioned by the approach of a tropical cyclone that formed somewhere over the Pacific Ocean off the Mexican coast. Hurd has shown in his discussion, *Tropical cyclones of the eastern north Pacific*, reprinted on the backs of numerous editions of *Pilot Charts*, that such storms are by no means infrequent; that they attain great force, and sometimes move northward along the coast, recurving over northern Baja California or southern California.

For several days previous, dynamically heated winds prevailed over southwestern United States, due to an anticyclone of moderate intensity that was crested over the Plateau region, and a low barometric system over the Pacific slope. However, it was not until we could chart the movements of this Pacific cyclone that we were able to explain the causes that gave rise to the apparently inexplicable phenomena of rain with very low humidity and temperatures which were obviously the result of adiabatic heating.

The following translations of those portions of the Mexican maps that refer to this cyclone are illuminating:

September 10.—There are indications of a cyclonic disturbance to the south of the Isthmus of Tehuantepec which will probably cause bad weather between Salina Cruz and Manzanillo.

September 11.—There are still indications of a cyclonic disturbance to the southwest of the port of Salina Cruz.

September 12.—To the southeast (? sureste) and near Acapulco indications of a cyclonic disturbance continue.

September 13.—To the southwest and near the port of Acapulco is located the cyclonic disturbance which has caused bad weather recently, and it is probable that it will move toward the region south of the Gulf of California.

September 14.—South of Manzanillo is found the cyclonic disturbance of the Pacific which appears to be moving toward the northeast.

September 15.—For lack of precise data it is not possible to know the position of the cyclone over the Pacific.

September 16.—The Pacific cyclone is found to the west and very near Mazatlan being probably between the land to the north and said port.

September 17.—We have no data of the Pacific cyclone, but the weather is becoming better rapidly in the region south of the Gulf of California.

September 18.—The cyclonic disturbance of the Pacific, almost dissipated, is found to the west of San Diego, Calif.

Gales and heavy rains occurred on the coast, and winds of hurricane force were reported at Manzanillo, Acapulco, and Mazatlan during the period from the 10th to the 14th.

A table showing the hourly changes in temperature, wind velocity and direction, and rainfall at San Diego and Los Angeles on the 17th, when the storm passed over southern California, is available for reference. Two days later the storm had completely disappeared.

The rainfall on the coast was light, but torrential falls occurred locally at points in the mountains, and considerable damage to property resulted.

SLEET AND SNOW AT UNUSUALLY HIGH TEMPERATURES

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An unusual phenomenon occurred at Corpus Christi, Tex. November 14, and was repeated on a smaller scale November 20, the occurrence of sleet and snow with the surface temperature above 50°.

Sleet began falling at 8 p. m. November 14, and continued intermittently until 10 p. m. The measured precipitation resulting from this sleet was nearly 0.004 of an inch. Several rather heavy showers of sleet fell during the 2-hour period, 8 to 10 p. m. The writer examined the sleet carefully, and there was no doubt that it was genuine sleet. Pellets remained unmelted for a few minutes after falling.

During the entire time this sleet was falling the surface temperature was above 50°. Temperature at 6:40 p. m. was 53°, after which there was a gradual fall to 50° at midnight. The sleet fell from alto-stratus clouds moving from the west. The surface wind was from the northwest.

Another slight fall of sleet and snow occurred during the morning of November 20. Snow fell in large flakes from 10:30 a. m. until 10:33 a. m., and sleet fell from 11:30 a. m. to 11:34 a. m. Surface temperature during the time of this fall was never below 57°, ranging from 57° at 6:40 a. m. to 58.5° at noon. The precipitation came from stratus clouds moving from the north-northeast. The surface wind was from the north.

The explanation of these unusual phenomena seems to be that a stratum of freezing air overspread Corpus

Christi at the time of sleet and snowfall. In the case of the sleet November 14 the air at the altitude of the clouds must have been above freezing, while below this level considerably below freezing existed, and this layer of subfreezing air was probably not more than 1,000 feet above the ground.

DISCUSSION

It seems most likely that the sleet and snow at Corpus Christi was the result of a cold current aloft but at a considerably higher altitude than that suggested by Mr. McAuliffe, viz, 1,000 feet above the surface. Freezing temperatures at that height would have caused an extremely steep lapse rate (3° C./100 m.) which is not probable. The Groesbeck kite flight of November 14 shows a very variable lapse rate with temperatures around the freezing point from the surface to 2,525 m. above sea level. It would seem more probable that the sleet and snow at Corpus Christi came from a rather high elevation and evidently reached the surface before melting due to the near freezing temperatures encountered. Mr. H. L. Choate of the aerological division suggests the probability of the cooling effect of the evaporation of some of the snow and sleet as making it possible for the remainder to reach the ground. He recalls a similar condition at Drexel where sleet and snow fell, and the temperature to 3,800 m. remained above freezing.—*L. T. Samuels.*